ANALYSIS OF PHASE I
DELTA HABITAT

DRAFT
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INTRODUCTION

The Diversion Effects on Fisheries Team (DEFT) is examining the distribution and magnitude of habitat restoration during Phase I of the CALFED process. The key current questions are: Where should Delta habitat restoration be located for Phase 1 (7-10 years) for all alternatives? How much habitat should be restored?

The CALFED draft ERP has identified the need to protect/restore/rehabilitate functional aquatic and associated habitat types from the tributaries to the ocean. Although the Delta is the primary focus of this current DEFT exercise, the full geographic range of habitat needs to be kept in mind. More specifically, habitat enhancements on the tributaries to the Sacramento or San Joaquin Rivers are not considered in the current analysis, despite their likely pivotal importance to the recovery of salmon and other native species. It should also be noted that this analysis also does not consider diversion screens, facility operations or the facilities themselves. The focus is on the distribution and magnitude of habitat restoration during Phase I of the CALFED process.

The term restoration as used in this white paper encompasses several concepts. The protection of functional aquatic habitat is the most cost-effective means of meeting habitat objectives. The restoration of habitat, including full ecological structure and function, may be desirable in some cases. In many cases, however, the rehabilitation of some of the functions and structure of key habitat may be most practical, given various constraints. For current purposes, the generic term "restoration" is used to encompass all of these concepts

It is intended that the following principles be consistent with the CALFED ERP.

PRINCIPLES

Salmon Principles:

Wetland habitat (shaded riverine aquatic, floodplain wetlands, shallow aquatic habitat ,tidal wetlands, etc) along the migratory pathways of salmon will reduce mortality and increase passage survival.

- Utilization of near shore habitat and vegetated wetlands by juvenile salmon (pre-smolts) has been documented, both upstream of the Delta and within the Delta, and is an important process under at least some conditions.
- Some restored habitats would also be favorable for some salmon predators, but in the opinion of most salmon biologists the increased cover and food supply should increase

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salmon survival and provide net benefits. This is consistent with the general ecological principle that diverse habitats sustain diverse communities.

- Consistent with restoration ecology principles, the size and connectivity of patches of habitat is probably as important as habitat quality in this system.
- The restoration of seasonal floodplain appears, at this time, to offer potential advantages over the restoration of permanent wetlands. The timing of inundation of seasonal wetlands, such as floodplains, seems to favor native species. In addition, exotics such as Egeria, largemouth bass and other exotic predators apparently do better in permanent rather than seasonal wetlands. Finally, restoration of seasonal floodplains may involve less conflict with agriculture.
- Salmon fry rearing habitat is needed, particularly during wet years in which fry exit their natal streams early in the year rather than holding until late Spring.
- The restoration of tidal wetlands is potentially an important component of the life history of chinook salmon, by providing rearing habitat for juvenile rearing from October through July. Tidal action is an important component of habitat complexity, which appears to be critical for providing refugia from predators. Although documentation of estuarine habitat utilization by chinook juveniles in the Bay-Delta system has lagged that of other West coast estuaries, a strong case can be made that restoration of such habitat should be emphasized.
- The following preliminary criteria are proposed for initial discussion purposes:
  - Patches of habitat, say adjacent to the main channel, should be big enough to sustain channels within them -- maybe no less than 0.5 km along the minimum axis.
  - Patches of habitat should ideally be continuous. Since this is impractical in some situations, patches of habitat should be close enough to permit most outmigrants to move the distance between them on one tidal cycle, say no more than 2 km apart in order to accommodate slow moving juveniles.
  - This habitat should be arrayed along the major migratory corridors.
  - Alternatively, this habitat might also be satisfied through benches on the water sides of levees so that it is inundated at high water, like floodplain, but doesn't support Egeria et al. through the rest of the year.
- Additional research is needed to help prioritize the importance of various salmon habitat types (SRA, floodplain wetlands, shallow aquatic habitat, etc) along passage corridors and determine the most appropriate locations for habitat restoration. Such research should not delay aggressive pilot implementation of such habitat restoration.

Native Species Principles:

Native fish populations, including Delta smelt and chinook salmon, have high potential to benefit from restoration of various types of diverse aquatic habitat, including floodplain wetlands, permanent tidal wetlands and brackish tidal wetlands.

- Data from the Yolo Bypass and the San Joaquin River (under high flow conditions) suggest that floodplain habitat can positively affect recruitment of resident fish species. This is consistent with our understanding of the biology of these species and of the historic hydrology and distribution of wetlands in the Central Valley.

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- Access to flooded vegetation for spawning seems to be part of the life history of every native fish, except tule perch and sculpins.
- Permanent wetlands (including tidal channels that fish probably require) serve as rearing areas later in the Spring and as foraging habitat year-round for some species – tule perch, sculpins and splittail.
- Suisun marsh and the western Delta are likely areas for improved habitat for these species because the varying salinities seem to exclude a number of exotic species.
- Research is needed to clarify the relative importance of the various types of aquatic habitat. Such research should not delay aggressive pilot implementation of such habitat restoration.

Striped Bass Principle:

Increasing the amount of marsh habitat for nursery areas adjacent to Suisun Bay and San Pablo Bay would likely increase the survival of young striped bass.

General Habitat Location Principles:

1. ***Locating restored or rehabilitated habitat away from major sources and pathways of high mortality makes good sense.***

    - Locating new habitat away from the pumps would obviate export pump entrainment of species such as Delta smelt. This would avoid increasing populations, only to have them entrained.
    - Such new habitat should be within the historical range of the species of interest. To create, say, rearing habitat beyond the normal range of the species rearing distribution has little merit.

1. ***The restoration of 'interception habitat' (providing cover, food organisms, etc.) along the pathways of water to the export pumps will benefit native fish populations.***

    - This principle is controversial and in seeming conflict with the previous item.
    - Issues: Can testable hypotheses be developed for the research? What is big enough? How can change be detected? Are the appropriate techniques available to test the hypotheses? Is a research project viable? Can we really determine cause and effect?
    - Can an adequately sized and designed pilot project with appropriate supporting research resolve the important scientific and environmental management issues associated with habitat in the south Delta?

Experimental Principles:

1. ***Pilot projects, with supporting research, can resolve the scientific and planning issues of habitat importance and priority of restoration.***

- Understanding the contributions of various habitat types to species survival is important in prioritizing actions. For example, how does restoration of spawning habitat in a tributary compare to restoration of rearing habitat in the Delta? Developing such a rational framework depends on adequate, timely research.
- The design of such pilot projects and associated research has the potential to be long and costly and thus divert resources from more beneficial projects. However, delay in implementing broadly supported projects because of lack of information needs to be avoided. (Avoid paralysis by analysis.)

1. ***Research to determine the utilization of Delta habitat by native versus exotic species can result in planning and implementation decisions which favor increasing native species populations.***

- Do the various types of habitat, when restored or rehabilitated, benefit native species more than exotic species, particularly predators?

1. ***Restoration habitat locations should be big enough to count.***

- The scale of initial restoration pilot projects should be large enough to have measurable effects.
- Subsequent restoration projects need not meet this measurable effects criterion, but community benefits likely relate to habitat size and connectivity. Small, isolated pieces of habitat should be endorsed with hesitation. However, such relatively small pieces could play important roles by increasing connectivity among larger habitat units.

Linkage Principles:

1. ***Restoration goals and objectives need to be pursued within available means.***

- Research and monitoring are essential components associated with habitat restoration.
- Costs of these activities need to be explicitly covered, but not be so large as to prevent project funding.

1. ***To reduce conflict, the use of public lands for habitat purposes should be evaluated before considering acquisition of private lands.***

- The loss of agricultural lands has indirect impacts that should be avoided when possible.

1. ***Recreational conflicts and opportunities need to be considered in selecting restoration habitat locations.***

Principle on Quantity of Habitat:

General ecological principles and historic habitat distribution in the Delta suggest that more habitat is better than current conditions; this issue needs adaptive planning and management.

- Despite the broadly supported benefits of habitat restoration, we do not know how much is enough to accomplish CALFED objectives. This subject will require adaptive management.
- Research is needed to quantify the most important habitat relationships. Such research should accompany early implementation, Stage 1, but should not impede early implementation.

Principle on Recreation and Public Appreciation:

Public recreation and appreciation of the benefits of restoration should be integrated into the restoration program.

Implementation Principles:

Projects that benefit the most native fish species should be prioritized over projects that benefit fewerspecies.

Habitat during Stage 1 should not be scattered widely through the Delta, but should be concentrated to create early population benefits and demonstrate easily perceived progress.

PROPOSED HABITAT DISTRIBUTION FOR STAGE 1:

- The Prospect-Liberty Island-Little Holland area above Cache Slough has been known for some time for its potential to be a large area of shallow, tidal freshwater habitat. Prospect Island is undergoing active restoration. This 'native species' habitat is consistent with the principles identified above and makes good sense under all alternatives. "Take" problems for local diverters, acquisition issues, restoration design issues and funding will need to be addressed. The area to be restored/rehabilitated should be as large as possible consistent with available funding and willing sellers.

- Creation of new shallow tidal wetland habitat in the vicinity of Suisun Bay, Sherman Lake and Big Break is supportable under all alternatives. The area to be restored/rehabilitated should be as large as possible consistent with funding and willing sellers.

- Shaded riverine aquatic and riparian habitat should be restored/rehabilitated along all practicable reaches of the Sacramento River, San Joaquin River, Georgiana Slough and Steamboat Slough. In some cases, such work could be done in conjunction with major flood control projects or levee projects in the area. These are migratory passage corridors for Chinook salmon. Such habitat is consistent with the above principles and is supportable under all alternatives.

- Shaded riverine aquatic habitat (SRA), riparian habitat and tidal freshwater habitat should be located along the North and South Forks of the Mokelumne River to bolster passage of

salmon from the Mokelumne and Cosumnes rivers. Such habitat is believed to be important for reduced mortality and increased survival of salmon from these rivers and could substantially help fry rear to emigration size and condition. Such habitat is consistent with CALFED Alternative 3, but may not be consistent with Alternative 2, depending on configuration. Under Alternative 2, the Mokelumne River would be a major conveyance route for water from the Sacramento River southward towards the pumps.

- Implementation of a restored habitat corridor, including floodplain, SRA, and wetland habitats, from the Cosumnes River to the San Joaquin River would provide many ecological benefits. The Cosumnes is the only tributary to the Delta that does not have a major dam, and involves extensive opportunity to integrate fish habitat across broad expanses of wetlands. This outweighs any negatives of Alternatives 1 and 2 for most species. Such habitat is consistent with the above principles and is supportable under all alternatives.

- A large, habitat restoration pilot project in the South Delta should be designed and implemented to evaluate the advisability of South Delta restoration and test the hypothesized use of 'interceptor habitat'. The factors apparently limiting fish utilization of existing shallow vegetated habitat (i.e. Mildred Island) need to be identified. Such a pilot project is consistent with the above principles and is supportable under all alternatives.

- Floodplain restoration along the San Joaquin River has high potential to assist native fishes such as splittail. A substantial project is warranted and would be consistent with all alternatives.

- Restoration of the floodplain of the Sacramento River has high potential to assist native fishes such as splittail. A substantial project is warranted and would be consistent with all alternatives.

- Frank's Tract could likely provide a greater contribution to the fishery than occurs currently. A well-designed restoration project for this area is desirable and consistent with all alternatives. Such a project could create a broad expanse of diverse wetland habitats with more diverse benefits than the existing condition.

- Habitat restoration in the Yolo Bypass has many ecologically attractive features, but poses challenges to biological value because of its primary use for flood control purposes. The bypass weirs are not currently operated to produce natural rates of inundation and water recession in the Yolo Bypass. At such times, flood control operations will likely continue to be in conflict with more natural patterns of floodplain inundation. Issue: Are there concepts for rehabilitating ecological functions in this area that would work? If so, such projects would be consistent with all alternatives.